

COVID Operation Theatre- Advisory and Position Statement of Indian Society of Anaesthesiologists (ISA National)

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Corona virus disease 2019 (COVID-19) caused by SARS-CoV-2 has spread worldwide and has affected millions of people. Patients with COVID-19 may have to undergo elective or emergency surgical procedures under local or general anaesthesia. It is advisable to postpone elective surgeries in such patients, even if they are asymptomatic, till the time they test negative for this virus. There are reports of higher incidence of morbidity and mortality in COVID infected patients following surgery. However, emergent surgeries would be required to be carried out, like cesarean sections, acute abdominal conditions, pediatric and neonatal emergencies, trauma, tracheostomies in Intensive Care Unit (ICU) and the like. Such emergency surgical procedures necessitate setting up of dedicated *COVID OPERATION THEATRES (COVID OT)*.

SETTING UP COVID OT

1. Name of Operation Theatre

- Dedicated Operation Theatres are to be used for all confirmed or suspected COVID-19 infected patients
- These operation theatres should be labeled as "COVID-19 Operation Theatre (COVID OT)"
- Large clear bill boards and signage in local language and/or english, visible from a distance, should be placed outside such OTs

2. Number of Operation Theatres

- Ideally, there should be 2 COVID OTs:
 - One for obstetrical surgical procedures
 - Second for general surgery/orthopaedics/other surgical procedures for all age groups

3. Location

- The operation theatres should be located in the dedicated COVID Block/Centre
- There should not be any adjoining inhabited buildings within 20 meters
- COVID OTs should be preferably located near to COVID ICU, High Dependency Unit (HDU), Isolation ward and Emergency ward

4. Changing Room

- There should be separate changing rooms for male and female health care workers with attached toilet and shower facilities

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- Ideally, independent changing rooms with toilet and shower facility should be there for doctors, nurses and support staff
- There should be provision for opening the doors with feet or elbow without touching the handles

5. Donning Area

- There should be a dedicated donning room adjacent to the scrub room
- The pre-sterilized Personal Protective Equipment (PPE) Kits should be available in adequate number in donning area. It should have chairs and hand sanitization facility

6. Doffing Area

- There should be a dedicated doffing room with hand sanitization facility and waste collection bins
- Used PPEs should be disposed as per the Bio Medical Waste Management guidelines

7. Separate Entry and Exit

- The entry to the donning area and the exit from the doffing area should be separate so that there is no “mixing up” of the health care workers entering and leaving the operation theatres

8. Air Conditioning of OT

- *Airborne infection isolation requirements (AIIR)* have to be strictly enforced
- The most important factor in COVID -19 pandemic is to ensure that the virus laden airborne particles do not leak out of the rooms occupied by COVID-19 patients and also to maintain the concentration of virus laden particles inside the COVID-19 patient room at a minimum. This is required to control the spread of infections and also to protect the healthcare workers
- As it is in normal practice, most of the OTs would be served by a Heating, Ventilating, Air Conditioning (HVAC) system that would be of a recirculatory type, wherein the air from the OT is taken back to the air handling unit (AHU) for thermal conditioning and brought back
- The same HVAC system can also be connected to a few other areas of the hospital. In some cases, there may be no dedicated return air duct but only a ceiling return system. If a COVID-19 patient has to be operated in such an OT, it will present a

significant risk of the virus laden particles spreading out from the designated COVID OT

- Since, majority of operation theatres in India are not negatively pressurized, the positive pressure system and central air conditioning must be turned off
- To convert an existing OT into a COVID OT, it is first necessary to convert the OT into a non-recirculatory system (100% once through system)
- On an emergency basis, this can be achieved by blanking (blocking) off the return air vents in the OT. It is important to make sure that the AHU will have provision to receive adequate outdoor air supply. The outdoor air source for the AHU shall not be from within the building and all care shall be taken to avoid intake of outdoor contaminants, to the best possible extent. Additionally, an independent exhaust blower shall be provided to extract the room air and exhaust out into the atmosphere, preferably, after suitable “exhaust air treatment”
- The exhaust air quantity should be greater than the supply air quantity so that a negative pressure of minimum 2.5 Pa (preferably >5 Pa) is achieved in the room. The supply air quantity should provide a minimum of 12 air changes per hour. The position of the extract air duct in the OT should be just above the head of the patient
- As a next best possible option, the COVID OT can have stand alone room air-conditioners. Room air conditioners re-circulate air within a single occupied zone. Two split air-conditioners of 2 tons refrigeration capacity per OT are usually required. Recirculation of cool air by room air conditioners, must be accompanied by outdoor air intake through slightly open windows and exhaust by natural exfiltration. Fresh air intake through a fan filter unit will prevent outdoor dust entry (containing high levels of PM 10 and PM 2.5 particles) and exhaust fans should be kept operational. Set the room temperature between 24°C and 30°C. Maintain relative humidity between 40% and 70%. (In humid climates set the temperature closer to 24°C

for de- humidification and in dry climates closer to or at 30°C and use fans to increase air movement)

- This will make working somewhat comfortable while wearing personal protective equipment (PPE), especially during the summers
- Negative pressure could be created by putting up 2-3 exhaust fans which will drive air out of the room. However, exhaust fans can lead to significant noise pollution and some compromise in OT sterility
- For respiratory isolation, an isolator with a filtered air supply and exhaust can be applied over the patients face
- Treatment of exhaust air can be done preferably by high efficiency particulate air (HEPA) filtration. When not possible, treatment of exhaust air by chemical disinfection (1% hypochlorite) is acceptable. When both the methods are not feasible, the exhaust air shall be let off into the atmosphere through an upward plume at a height of 3 m above the tallest point of the building, thereby lowering the viral load concentrations to insignificant levels by dilution. This exhaust discharge shall be well away from other air intake points and populated places. The other two options available for exhaust air treatment being Ultraviolet (UV) irradiation (15 minutes) and heating (45 min at a temperature of 75°C)
- Planning should be started urgently for dedicated central air conditioning for COVID OT with provision for altering the pressure in OT (making it negative pressurized). The system should have HEPA filters and there should be no leaks in exhaust ducts. Suitable renovation/modification should be carried out in this regard so that there is no mixing up of the air between COVID and non COVID operation theatres
- Ideally there should be central air conditioning with dedicated fresh air cycles depending upon the size of the operation theatre with HEPA filters and independent AHU

9. Remove all non-essential equipment and gadgets

- Only essential items should be inside the operation theatre

- They should be easy to clean and do not conceal or retain dirt or moisture within or around them
- Do not put extra/stand by equipment, trolleys, consumables inside the COVID OT
- Place all equipment and drugs essential for the anaesthetic management in a tray and avoid handling of the drug trolley during the case
- Similarly, the surgical equipment, linen and dressings which are essential should be kept ready on separate trolleys

10. Transparent Plastic Sheet Covers

- Cover all monitors, cables, anaesthesia work station/machine, cautery, operation table, patient trolley, etc with transparent, water resistant plastic sheets. These plastic coverings should be removed and changed after each case

11. Disposable equipment

Use disposable equipment as far as possible, like-breathing circuits, face mask, tracheal tubes, etc

12. Heat and Moisture Exchanger with Viral Filters (HMEFs)

- Place two high quality Heat and Moisture Exchange Filters (HMEFs). First, between tracheal tube and breathing circuit; and the second between expiratory limb and anaesthesia machine
- These HME filters can remove up to 99% of airborne particles of size 0.3 microns or greater, thus helping in preventing contamination of OT atmosphere
- Apply a third HMEF on tracheal tube itself, if feasible

13. Scavenging

- Active scavenging is not available in majority of the hospitals
- It is suggested that corrugated tubing can be applied to the scavenging port and that can be dipped in a bucket with 1% hypochlorite solution
- Suitable PPE should be used while handling the hypochlorite solution and direct contact with skin and eyes should be avoided

14. Aerosol generating procedures (AGP)

- Aerosol generating medical procedures are tracheal intubation and extubation, suctioning, nebulization, CPAP, BiPAP

or high-flow nasal oxygen therapy, bronchoscopy, etc

- Aerosolization is also increased when more than one attempt at intubation is required.
- The chances of exposure to the virus are maximum during such high aerosol generating procedures
- During AGPs, all health care workers should always wear full component of proper PPE Kit (Cover all gown, N95 mask, eye shield, cap, double gloves, shoe cover)

15. Number of personnel inside the COVID OT

- There should be minimum required personnel inside the COVID OT
- On an average 7-8 PPE Kits are required for a surgical procedure:
 - i. Surgeons: 2 (1, if feasible)
 - ii. Nurse: 1
 - iii. Anaesthesiologists: 2 (1, if feasible)
 - iv. Anaesthesia Technician: 1 (if 2 anaesthesiologists, then not required)
 - v. Paediatrician: 1 (for cesarean section)
 - vi. Resource Person: 1 (OT Master/Bearer)
 - vii. Sweeper: 1
 - viii. Transfer Personnel: 1

16. Personal Protective Equipment (PPE) Kit

- All operation theatre staff should wear PPE including anaesthesiologists, surgeons, nurses, technician, bearer, sweeper, etc
- Wear certified and proper Personal Protective Equipment (PPE). Use of uncertified and spurious protective gear will give a false sense of security and is hazardous
- Sample Specifications of Personal Protection Kit (PPE) are:
A Sterile set containing-

1. Cover All - 1

- Single piece wearable coverall with head hood cap (jacket or nun type), impermeable to blood and body fluids
- Medium and Large size, light colour
- Thumb/finger loops to anchor sleeves in place
- Quality compliant with following standard: Meets or exceeds ISO 16603 class 3 exposure pressure, or equivalent
- Due to scarcity of coveralls, and risk versus benefit, and considering this as an emergency temporary measure in larger public interest, in present given circumstances, the fabric that cleared/ passed 'Synthetic Blood Penetration

Resistance Test' (ISO 16603) and the garment that passed 'Resistance to penetration by biologically contaminated solid particles (ISO 22612:2005) may be considered as the benchmark specification to manufacture Coveralls. The Coveralls should be taped at the seams to prevent fluid/droplets/aerosol entry. The test for these two standards (ISO 16603 and ISO 22612:2005), which can be performed in Indian laboratories are as per WHO Disease Commodity Package (Version 4.0)

2. N-95 respirator mask- 1

- Shape that will not collapse easily and can be worn with full- face shield
- High filtration efficiency of at least 95% against particulate aerosols of <0.3 microns
- Good breathability, with expiratory valve
- Quality compliant with standards for medical N95 respirator: NIOSH N95, EN 149FFP2, or equivalent
- Fluid resistance: minimum 80 mmHg pressure based on ASTM F1862, ISO 22609, or equivalent

3. Shoe Cover- 1 pair

- Made of same material as coverall
- Should cover the entire shoe and reach above ankles, preferably up to mid- calf.

4. Goggles - 1

- Transparent glasses, zero power, well fitting, covered from all sides
- Goggles should also be able to accommodate prescription glasses
- Goggles should have an adjustable band which should secure firmly so as not to become loose during clinical activity

5. Face shield/visor - 1

- Made of clear plastic for full face protection with padded support on forehead area and comfortable elastic band
- Completely covers the sides and length of the face
- May be re-usable (made of material which can be cleaned and disinfected) or disposable

6. Sterile gloves-2 pairs

7. Waste collection Bag-1

All the items supplied need to be accompanied with certificate of analysis from national/ international organizations/labs indicating conformity to standards

17. Communication Issues

It is difficult to communicate with PPE on, so the team should practice sign language for easy, quick and correct communication

18. Telephone Facility

- No bag, purse, mobile phone is allowed inside the OT
- If intercom facilities are not available inside the OT, then one mobile phone with transparent plastic covering can be used for communicating with medical personnel and support staff outside the OT

19. Oxygen Supply

- There should be adequate oxygen reserve
- Any oxygen/nitrous oxide cylinder inside the OT should be considered as infected. It should be cleaned with 1% sodium hypochlorite before being sent for refilling

20. Sterilization and Decontamination

- There should be enough time between two cases (approximately one hour) to allow OT staff to send the patient back to the ward, conduct thorough decontamination of all surfaces, screens, keyboard, cables, monitors, anaesthesia machine, etc
- The agents used in decontamination are hydrogen peroxide spray disinfection (through vaporized hydrogen peroxide generator (VHPG), 1% sodium hypochlorite solution, or 75% alcohol wiping off solid surfaces of the equipment and floor. All floors and walls to be cleaned with 1% sodium hypochlorite solution
- Before starting the decontamination, the staff has to remove the outer hand gloves
- Discard breathing circuit, mask, tracheal tube, HME filters, gas sampling line and soda lime after every surgery. Water trap to be changed if it becomes potentially contaminated
- All surgical linen and dressings, markers, etc. are to be discarded
- All unused items on the drug tray and airway trolley should be assumed as contaminated and to be discarded
- Seal all used airway equipment in a double zip-locked plastic bag. It must then be removed for decontamination and disinfection
- The histo-pathological specimens are to be kept in tight fit plastic boxes which are then sealed in plastic bags. The plastic bags

are then wiped clean before sending for examination

- The metallic equipment to be kept in 1% sodium hypochlorite solution for half an hour. They are then washed and wiped clean. They are subsequently put in instrument boxes and covered with plastic bags
- All the equipment being sent to Central Sterile Supply Department (CSSD) should be covered by plastic bags which should be clearly labeled. All such equipment should be sterilized in a dedicated area and should not be mixed with OT equipment from non-COVID areas of the hospital. It is preferable to have an autoclave machine/CSSD near the COVID OT
- The surfaces of passage ways and the elevator should also be cleaned with sodium hypochlorite and alcohol.

21. Surgical Procedures to be performed in COVID OT

- The need for performing a surgical procedure will be discussed amongst all including surgeons, anaesthesiologists, patient and attendants
- The decision of the team to perform a surgical procedure will not be challenged

22. Surgical Procedures in suspected COVID-19 patients

- The assessing team will specially focus on patient's signs and symptoms, history of contact/exposure and travel, living in an area with high incidence of COVID-19 or containment areas, etc
- The decision of operating team to treat a patient as suspected COVID positive will not be challenged

23. Wheeling In the patient

- Once operating team is ready including surgeon, anaesthesiologists, nurse, bearer, then COVID-19 infected patient is wheeled through a separate/isolated corridor to the operation theatre
- The patient should be wheeled directly into the OT
- The patient should not stay in premedication room at all
- The patient should wear autoclaved operation theatre clothes, cap, surgical/N 95 mask and should be covered with a plastic sheet

- A surgical mask or N95 mask must be applied to the patient throughout the length of stay in the operating room

24. Wheeling Out the patient

- Tracheal extubation should be done on the table, as far as possible
- Immediately place the surgical mask/N95 mask over the patient after tracheal extubation
- The patient is observed postoperatively in the operation theatre itself. The patient should not be kept in recovery room and should be transferred directly to the isolation ward
- In isolation ward, patient should be regularly monitored and oxygen should be administered, if required
- If tracheal extubation is not feasible, then shift the patient to designated Intensive Care Unit (ICU)
- If the patient is kept intubated, a single patient use Ambu bag with HME viral filter attached must be used during transfer

25. Transfer of the patient to isolation ward/ICU

- The transport personnel removes the existing PPE and cleanse the hands. He then wears fresh PPE and transports the patient on a bed or trolley to ward/ICU
- The patient should be covered with plastic sheet and then transferred through a dedicated lobby and elevator
- The patient must wear a surgical mask or N95 mask during transfer

26. Use of Blood Products

- There have been no reported or suspected cases of transfusion-transmitted COVID-19. Individuals are not at risk of contracting COVID-19 through the blood donation process or via a blood transfusion, since respiratory viruses are generally not known to be transmitted by donation or transfusion
- Routine blood donor screening measures are used and ensure that blood donors are healthy, feeling well and free of respiratory illness symptoms
- There are no contraindications of blood transfusion to a COVID patient
- The logistics to arrange and collect blood bags in the COVID OT have to be preplanned

27. Neonatal Care/Resuscitation

- With regard to vertical transmission (transmission from mother to baby antenatally or intrapartum), emerging evidence now suggests that vertical transmission is probable, although the proportion of pregnancies affected and the significance to the neonate is yet to be determined. At present, there are no recorded cases of vaginal secretions and breast milk being tested positive for SARS-CoV-2
- It is preferable to do neonatal care/resuscitation after a cesarean section in the second OT (if available) or just outside the COVID OT to minimize the exposure to the neonate and paediatrician

28. Laparoscopic Procedures

- Ultrasonic scalpels or electrical energy devices used in surgery can produce large amounts of surgical plumes during laparoscopic or open surgery
- Insufflation is usually achieved using carbon dioxide. On desufflation, a surgical plume is created which is a source of biological contamination including blood cells, cell debris and potentially viruses
- There is a potential for viral release under pressure on desufflation. There is limited evidence that SARS-CoV-2 is present in surgical plumes. However, other viruses have been detected in surgical plumes generated during laparoscopic and other aerosol generating procedures
- Limited use of lower energy devices may reduce the viral load and would seem more desirable to use
- Specifically for laparoscopic surgery, desufflation of pneumoperitoneum must be performed by an appropriate suction device attached to a HEPA filter to prevent venting into the operating room

29. Staffing the COVID OT

- Minimum number of staff required will work in shifts in COVID OT
- Institutional policies for quarantine of the staff working in COVID OT should be made
- In between the shifts, the staff working in COVID OT who does not want to go home will have to be given suitable accommodation by the hospital

- Those going home will have to tailor the approach according to the risk profiles of the family members (immune-compromised children, elderly parents, two physician homes). This will include living in separate dwellings or partitioning their homes
- This can cause tremendous work stress- both clinical and psychological. The staff will have to be psychologically counseled and kept motivated
- Any health care worker who develops flu like symptoms should immediately inform authorities

30. Mock Drills

- Do mock drills for correct donning and doffing of Personal Protective Equipment (PPE) including cover all gown, N 95/FFP3 face mask, eye shields/face shields/visor and gloves
- Mock drill of a surgical procedure from wheeling in to wheeling out the patient from operation theatre should also be done to get accustomed and know practical problems

STANDARD OPERATING PROCEDURE (SOP) FOR CONDUCTING ANAESTHESIA FOR A SURGICAL PROCEDURE IN COVID OT

1. After putting on the OT clothes, go to scrub room and scrub
2. After scrubbing, go to the Donning Room and wear pre-sterilized Personal Protective Equipment (PPE)
3. Standard routine anaesthesia monitoring to be instituted
4. Prefer regional anaesthesia, where ever possible.
5. In case supplementary oxygen is needed, the oxygen mask is applied over the surgical mask or N95 mask
6. For general anaesthesia, pre-oxygenate for five minutes with 100% oxygen. Avoid high flow oxygen to prevent aerosolization
7. Instruct the patient not to cough. It is prudent to cover the patient's nose and mouth with two layers of wet gauze to block some of the secretions. In premedication, antitussives and antihistamines can be used
8. The choice of induction drugs is dictated by haemodynamic considerations. Midazolam with etomidate or propofol, depending upon patient's haemodynamic condition, can be used for induction. Fentanyl is recommended for analgesia. If no contraindications are present, succinylcholine 1 mg/kg should be administered for tracheal intubation
9. Tracheal intubation should be done by experienced anaesthesiologists. Limit the number of anaesthesia team personnel (maximum three) inside the OT. Second clinician with PPE can be available outside the OT for immediate assistance
10. Rapid sequence induction and tracheal intubation (with cricoid pressure) to be done in the first attempt. Ensure adequate neuromuscular blockade to avoid bucking that can increase aerosolization
11. Intravenous lignocaine has been used to prevent cough following premedication with an opioid, such as fentanyl before tracheal intubation. It has also been used to prevent emergence coughing during tracheal extubation
12. Avoid manual ventilation to prevent aerosolization of virus from airways. If manual ventilation is required, apply small tidal volumes
13. Immediately inflate the tracheal tube cuff before starting ventilation to prevent aerosolization. Immediately block/clamp the tracheal tube. Apply the HMEF on tracheal tube itself, if feasible
14. Use Intubation box (made up of acrylic/plastic sheet), if available and feasible
15. Use plastic transparent sheets to cover the patient completely. Tracheal Intubation can be done by placing hands under the clear transparent plastic sheet, thus minimizing exposure to aerosolized virus
16. Avoid awake fiberoptic intubation whenever possible. Nebulization with local anaesthetic will aerosolize the virus
17. Video laryngoscope is preferred for tracheal intubation to increase the distance between the patient's airway and that of the anaesthesiologist who performs the intubation. It also improves intubation success rate and avoids multiple attempts at tracheal intubation
18. Resheath the laryngoscope blade immediately post intubation with the outer glove worn by the operator

19. Proper positioning of tracheal tube is confirmed by EtCO₂ monitoring and chest rise. Auscultation of chest is to be avoided
20. Use low gas flows and closed circuits. Limit the ventilatory disconnections and, if needed, do at end expiratory phase
21. A closed airway suction system, if available, is preferable to decrease viral aerosol production. If it is not available, the suction should be done by minimum members of the team
22. Supraglottic airway devices should be used only in 'cannot ventilate' situations. This will avoid manual bagging and provide rescue oxygenation
23. Prophylactic administration of antiemetic drug is preferred to reduce the risk of vomiting and viral spread. Vomiting is usually accompanied by coughing, which increases aerosolization
24. Go to the designated Doffing Room and remove the protective equipment. After removing the protective equipment, avoid touching your hair or face before washing hands
25. Go to the change room, discard OT clothes. All staff members have to take shower before leaving the OT and resuming their regular duties
26. In resource limited settings, where adequate personal protective equipment are not available, it is imperative to refer the patient to a centre with such facilities

The above document is an advisory and position statement based on current literature, resources and expert opinion. It is pertinent to state that new evidence is continuously emerging and guidelines are being issued regularly.

It is reemphasized that wear masks, do regular hand wash and maintain social distancing.

Let's work together to maintain health of our great nation India.

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